

Status of Lake Sturgeon in Michigan Waters of Lake Huron, Reported by Commercial Fisheries 2003

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INTRODUCTION

The largest indigenous fish to the great lakes is the lake sturgeon (*Acipenser fulvescens*) reaching lengths of over 6ft and weighing over 200 lbs. The largest on record was 7' 11" and weighed 310 lbs. Sturgeon are the oldest known species of fish living today dating back to the upper cretaceous period (136 million years ago). Lake sturgeon are relatively young for the sturgeon species, they are thought to have evolved from the Mississippi River Valley sturgeon 14 thousand years ago. Since that time, sturgeon have flourished in the Great Lakes occupying all five of the lakes.



Native Americans have always used lake sturgeon for products such as: food, oil, and leather (Holzkamm and Wilson 1988). Holzkamm and McCarthy (1988) indicated that some Native American tribes supplied isinglass (a clarifying agent made from sturgeon swim bladders) to the Hudson Bay Company. By 1880 European settlers began utilizing lake sturgeon for such products as: caviar, isinglass, fresh, smoked, or salted flesh, oil, fertilizer, leather, and delicacies from the brain, notochord, and belly (Prince 1905). This new demand for lake sturgeon initiated a commercial harvest that reached its peak in 1885-1889 culminating in 15,806,100 lbs harvested during the five years throughout the Great Lakes. From 1890-1994 the harvest of lake sturgeon have fallen averaging 1,781,316 lbs/ 5 yrs period (Auer 1999).

Today the US has virtually zero commercial harvest limited to Lake St. Clair and very limited sport fishery on lake sturgeon. The U.S. does allow some sport fishing for lake sturgeon limited to one fish per year in designated areas. Canada has commercial harvest which is now limited to Lake Huron and St. Lawrence River. Lake sturgeon are now considered threatened or endangered by 19 of the 20 states within its original range in the U.S. (Auer 1991). The primary cause for these listings is over-fishing and loss of habitat due to man-made obstructions such as hydroelectric dams which block river navigation by fish, pollution, and sedimentation from urbanization. Lake sturgeon are not quick to rebound from these affects because of their life history characteristics.

Lake sturgeon spend their entire life in fresh water, unlike most other sturgeon species that spend most of their life in the ocean only entering fresh water rivers to spawn. Lake sturgeon spawn from mid April through mid May. Males and females migrate to the spawning grounds when water temperature is 13-18°C. Peak spawning temperature for lake sturgeon appears to be 15-16°C (Kempinger 1988). The habitat characteristics of lake sturgeon spawning grounds consist of water depths ranging from 2-15 ft, with varying velocities and substrates (usually cobble and/or pebble substrate) (Organ 1978). An ovulating female may be accompanied by two or more males. Lake sturgeon do not create a redd (nest) for their eggs but rather disburse them in the current. The males fertilize the eggs as they exit the female. The eggs then adhere to the substrate of the spawning grounds (Lake Sturgeon- Recovery and Spawning Ground in St. Lawrence River video). Females produce 5,000 eggs per pound of body weight (a 150 pound female will produce 750,000 eggs). These eggs are left unguarded by the parents and fall prey to many fish species such as: white sucker (*Catostomus commersoni*), other sucker species, and the exotic round goby (*Neogobius melanostomus*). Eggs will hatch within 5-10 days beginning the most vulnerable stage in a lake sturgeon's life. This is the period between hatching and development of the sharp bony scutes (plates on the outside of the body). For a short time after hatching the larvae stay close to the spawning site embedded in the gravel while they absorb their yolk sac. After the yolk is absorbed the larvae start drifting down stream to nursery areas where they start feeding on invertebrates such as zooplankton. It is during these drifts that the larvae are at their most vulnerable. (Auer 2001).

Food items are taken in by a mouth, which is a tube like structure that extends and retracts from the underside of the snout to suck prey from the substrate. Sensitive barbells (antenna like appendages) at the end of the snout are used to locate food items. As lake sturgeon grow they feed on nymphs and larvae of aquatic insects such as: black flies (Chironomids), mayfly (Ephemeroptera), caddis flies (Trichoptera) and spongellaflies (Neuroptera). As they grow they move to a more diverse diet to include crayfish, fish eggs, fishes, worms (nematodes), leeches, amphipods, decapods, and few plants (Harkness and Dymond 1961).

Lake sturgeon do not reach sexual maturity for several years. Males reach maturity around 13yrs, females reach maturity around 19yrs (Houston 1987). Males reproduce every two years. Females reproduce every 4-6yrs, but can be as long as nine years (Rousow 1957). Because these fish are long lived (the oldest recorded lake sturgeon was 154 yrs), slow growing, late maturing, and do not spawn every year, it's impossible for these giants of the

Great Lakes to rebound quickly from over-fishing and loss of habitat. Because of their life history efforts undertaken to help restore these fish will not be recognized for many years.

The U.S. Fish and Wildlife Service-Alpena Fishery Resource Office (FRO) began monitoring lake sturgeon in Saginaw Bay of Lake Huron in 1995. Lake sturgeon became a species of concern because of the potential for federal listing and the need for a recovery plan. This report summarizes the activities of this project for 2001. Previous years reports can be found on the Alpena FRO web page (www.fws.gov/midwest/alpena) under station reports.

STUDY SITE

Lake Huron was formed approximately 10,000 years ago following the Wisconsin glaciation (Ryder 1972). This lake is comprised of three basins; the main basin, the North Channel, and Georgian Bay (Figure 1).

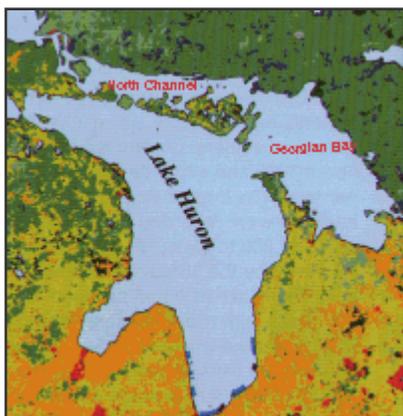


Figure 1. Lake Huron

Lake Huron has a surface area of 23,000 square miles (60,000km²)-- slightly smaller than West Virginia -- making it the fifth-largest freshwater lake in the world. Its name comes from early French explorers, who dubbed it "Lac des Hurons" (Lake of the Huron Indians). Bordered by the province of Ontario and the state of Michigan, Lake Huron measures about 206 miles long (332km) and 183 miles wide (295km) and has nearly 3,200 miles (5152 km) of shoreline.. At 579 feet (175m) above sea level, it averages 195 feet (59m) deep with a maximum depth of 750 feet (227m) and has a flushing time of about 22 years. About two-thirds of the lake's 51,700-square-mile (135,454 km²) watershed is still covered by forests, and the lake contains more than 30,000 islands. Lake

Huron lies in the center of the Great Lakes and receives discharge from both Lakes Superior and Michigan (Eshenroder et al. 1992)

Most of the lake sturgeon collected for this study came from Saginaw Bay, Lake Huron (Figures 2 and 3). Saginaw Bay is the second largest bay in the Great Lakes. It is 26 miles (42km) wide and is 51 miles (82km) projected into the land mass (Beeton et al 1967). Total area of the bay is 1,043 square miles (2,771 km²). The bay is divided evenly between the inner 15 feet (5m) deep shallows and the outer depths of 51 feet (82 km) for a total water volume of 24.5 km³. It is a shallow, well-mixed extension of the western shoreline of Lake Huron. Bottom substrates in Saginaw Bay range from silt to mostly cobble and rock.



Figure 2. Satellite photo of Lake Huron. Figure 3. Satellite photo of Saginaw Bay.

METHODS

Michigan state-licensed and tribal commercial fishers sometimes catch lake sturgeon as by-catch while using trap nets to harvest lake whitefish (*Coregonus clupeaformis*), yellow perch (*Perca flavescens*), and channel catfish (*Ictalurus punctatus*). These incidentally caught lake sturgeon were used to collect data for this species. Total length (TL), fork length (FL), and girth were measured for most captured lake sturgeon using a soft measuring tape. The leading (marginal) ray of the left pectoral fin was removed from some fish using a fin ray saw. U.S. Fish and Wildlife cross-sectioned each ray sample to count annuli and determine fish age (Figure 4). The U.S. Fish and Wildlife office in Alpena Michigan has recently acquired the new equipment a digital camera mounted a microscope to take pictures and aide in the aging process of fish. All sturgeon were returned to the water live.

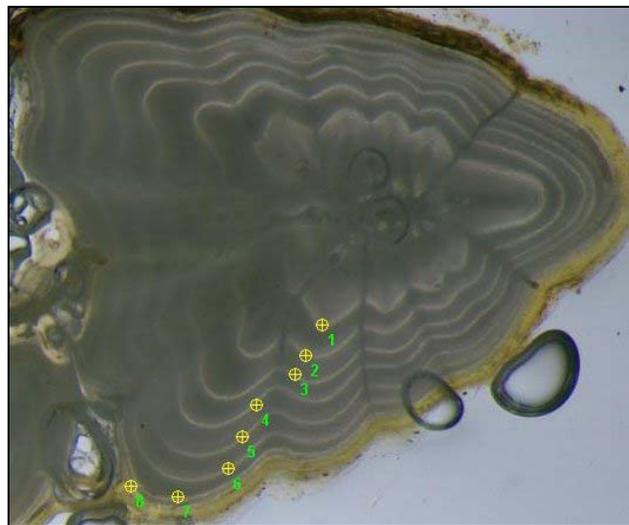


Figure 4. Cross-section of a lake sturgeon fin ray showing annuli to estimate age (8yrs old).

The distal portion of each fin ray collected is being utilized for genetic analysis. Fish were tagged in the dorsal fin with a serially numbered cinch floy tag (Floy tag and Manufacturing Inc, Seattle, Washington). All lake sturgeon were handled by the commercial fishers, including data collection and fish tagging (Figure 5).



Figure 5. Lake sturgeon on commercial vessel after being tagged and measured.

All materials necessary to collect the biotic information were provided by the Alpena FRO (Figure 6). Each fisher was provided a box containing instructions for fish tagging and fin ray removal, tags and an applicator, fin ray saw, data note book and cards, fin ray envelopes, a soft measuring tape, and a disposable camera. Abiotic data recorded for each lake sturgeon captured included date, latitude/longitude, water depth, water temperature, and bottom type. In addition tag type, agency, and identification number of tag applied or observed (if fish was tagged) were recorded.



Figure 6. Equipment provided by Alpena FRO to each commercial fisherman for taking and recording data from captured lake sturgeon.

To maximize the information collected on Lake Huron lake sturgeon, the Alpena FRO has been working closely with the Ontario Ministry of Natural Resources-Lake Huron Management Unit (OMNR-LHMU). Coordination between OMNR-LHMU and the Alpena FRO resulted in standardized data collection for lake sturgeon. This coordination enhanced the chances of recovering tag information lakewide and allowed a better understanding of the seasonal movement patterns of Lake Huron lake sturgeon.

RESULTS

Since 1995, 301 lake sturgeon have been tagged. This would not have been possible without the assistance of commercial fishers (Table 1). Commercial fishers tag and record biological data from sturgeon caught as by-catch during their normal fishing seasons. During the 2003 season, sturgeon were most frequently caught during the months of April and May (Figure 7). Figure 8 illustrates the months sturgeon were most frequently captured from 1995-2002.

Table 1. Number of lake sturgeon caught by commercial fishers. / indicates the fisher was not participating.

Fisher	Status	1995	1996	1997	1998	1999	2000	2001	2002	2003	Total
Barbeaux Fishery	Tagged	/	1	7	0	3	2	0	0	0	13
	Recapture	/	0	0	0	0	0	0	0	0	0
	Not Tagged	/	0	0	0	0	0	0	0	0	0
Bay Port Fish Company	Tagged	13	7	10	10	10	2	2	0	1	55
	Recapture	0	0	1	0	2	1	0	0	0	4
	Not Tagged	0	0	0	0	0	0	0	0	0	0
Beardsley Fishery	Tagged	/	/	0	0	0	1	0	0	0	1
	Recapture	/	/	0	0	0	0	1	0	0	1
	Not Tagged	/	/	0	0	0	0	0	0	0	0
Cedarville Fishery	Tagged	/	/	1	6	6	3	4	1	2	23
	Recapture	/	/	0	0	3	1	3	1	0	8
	Not Tagged	/	/	0	0	0	0	0	0	0	0
Gauthier-Spaulding Fishery	Tagged	2	0	2	2	4	1	0	0	0	11
	Recapture	0	0	0	0	0	0	0	0	0	0
	Not Tagged	0	0	0	0	0	0	0	0	0	0
Kuhl Fishery	Tagged	/	/	/	1	1	0	1	1	0	4
	Recapture	/	/	/	0	0	0	1	0	0	1
	Not Tagged	/	/	/	0	0	0	0	0	0	0
Lentz Fishery	Tagged	0	0	5	10	7	4	6	13	6	51
	Recapture	0	0	1	0	3	2	1	1	1	9
	Not Tagged	4	8	2	0	0	0	0	0	0	14
M & W Fish Company	Tagged	0	0	4	4	3	9	13	16	6	55
	Recapture	0	1	0	0	0	5	4	2	1	13
	Not Tagged	1	2	0	0	0	0	0	2	0	5
Sebewaing Fish Company	Tagged	/	/	/	/	/	/	2	2	2	6
	Recapture	/	/	/	/	/	/	0	2	0	2
	Not Tagged	/	/	/	/	/	/	0	0	0	0
Serafin Fishery	Tagged	/	7	16	3	4	7	17	10	0	64
	Recapture	/	0	1	0	0	1	3	3	0	8
	Not Tagged	/	3	0	0	0	0	0	0	0	3
Warren Beers Fishery	Tagged	0	0	0	0	0	0	2	0	0	2
	Recapture	0	0	0	0	0	0	0	0	0	0
	Not Tagged	2	0	1	0	0	0	0	0	0	3
Whytes Fishery	Tagged	0	3	4	4	3	1	1	0	0	16
	Recapture	0	0	0	0	0	2	1	0	0	3
	Not Tagged	2	4	0	0	0	0	0	0	0	6
Total		24	36	55	40	49	42	62	54	19	381

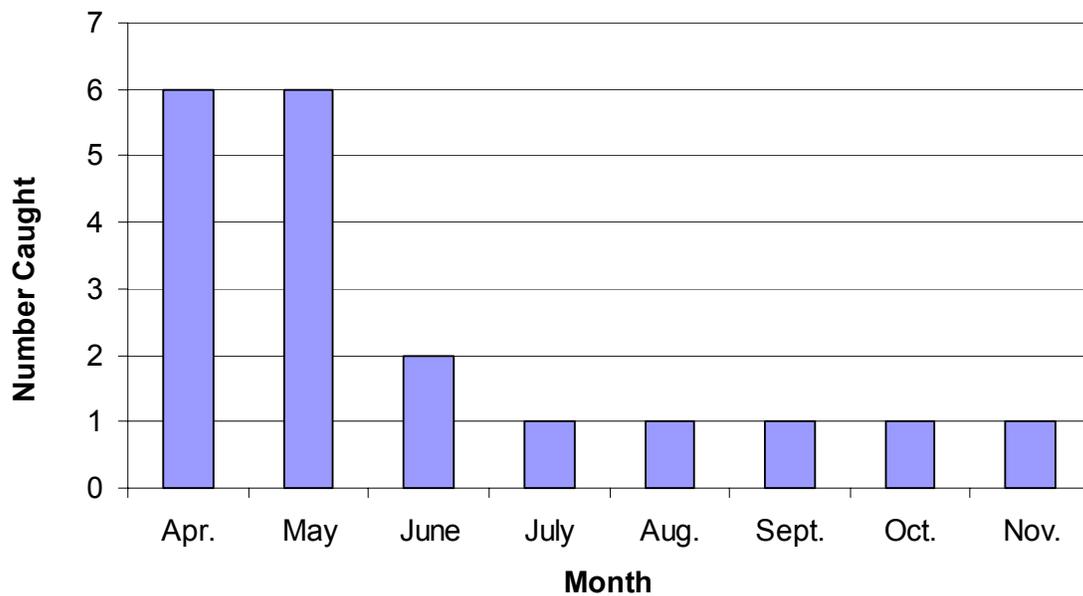


Figure 7. Number of lake sturgeon caught by month in Lake Huron by commercial fishers during the 2003 fishing season.

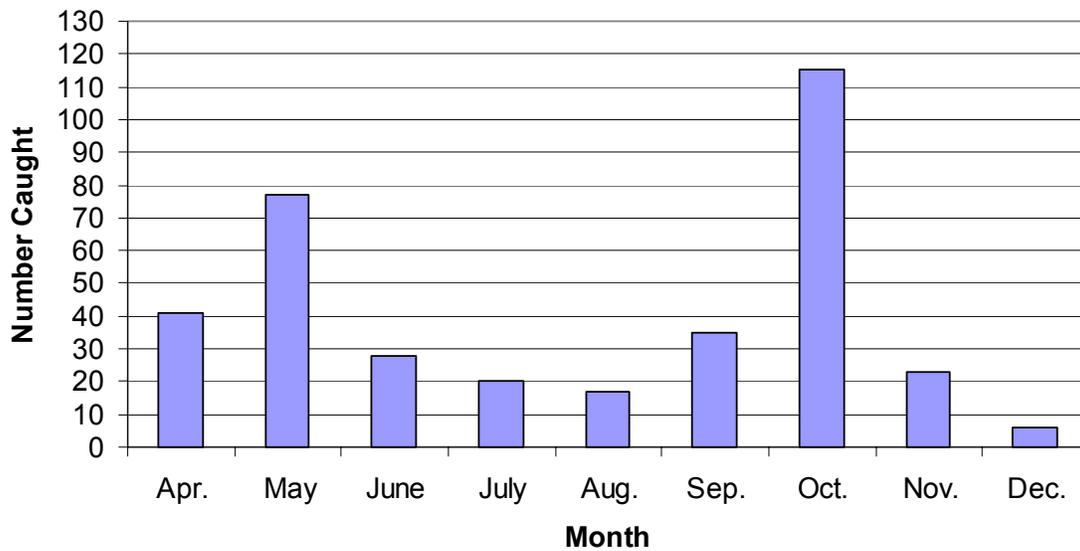


Figure 8. Number of lake sturgeon caught by month during the fishing seasons from 1995-2002 in Lake Huron by commercial fishers.

From 1995 through 2002 the mean total length (TL) was 114.9 cm, the smallest TL was 45.7 cm, and the largest TL was 190.5 cm. The mean girth was 44.3 cm, the smallest girth

was 14 cm, and the largest girth was 109 cm. Figure 9 illustrates the length frequency for lake sturgeon captured in 2003.

Lake sturgeon in the 90 cm range were most frequently caught. Figure 10 illustrates the length frequency of lake sturgeon captured from 1995 through 2002. Lake sturgeon in the 110 cm range were most frequently caught.

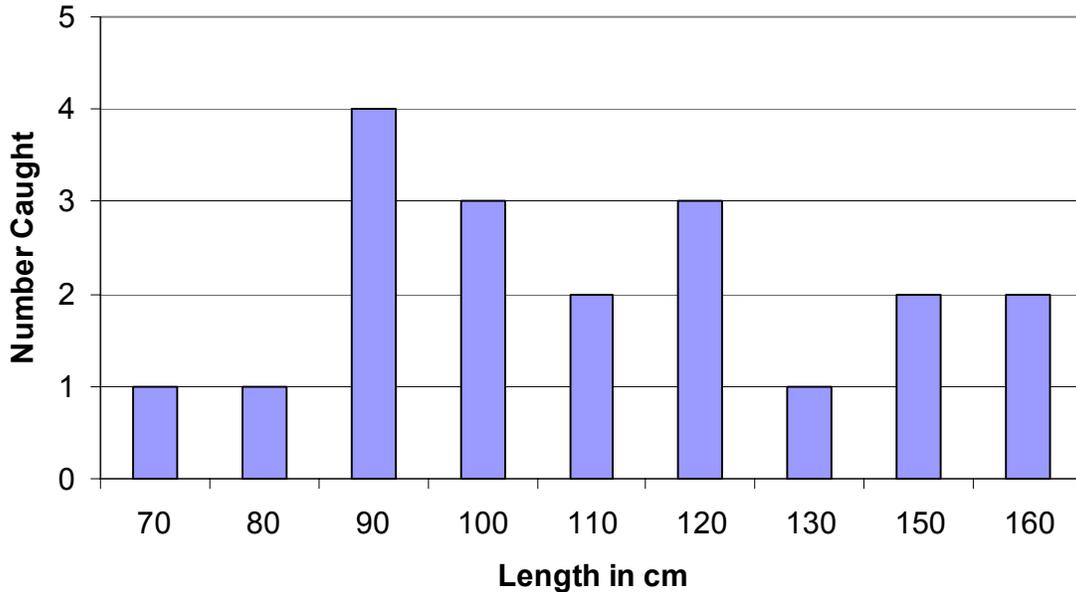


Figure 9. Number of lake sturgeon caught by commercial fishers by length in 2003.

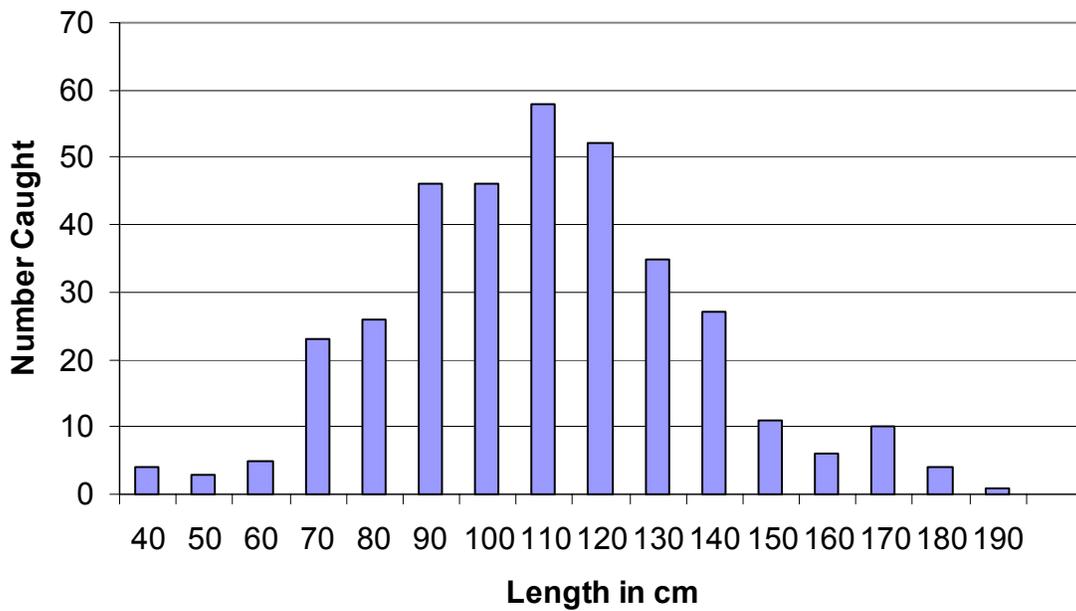


Figure 10. Length frequency of 254 Lake Huron lake sturgeon captured by commercial fishers from 1995 to 2002.

There were 2 lake sturgeon recaptured in 2003. Figure 11 gives the number of recaptured sturgeon from 1996 to 2003. Table 2 provides data on recaptured fish. Not all fish were measured at tagging and/or recapture.

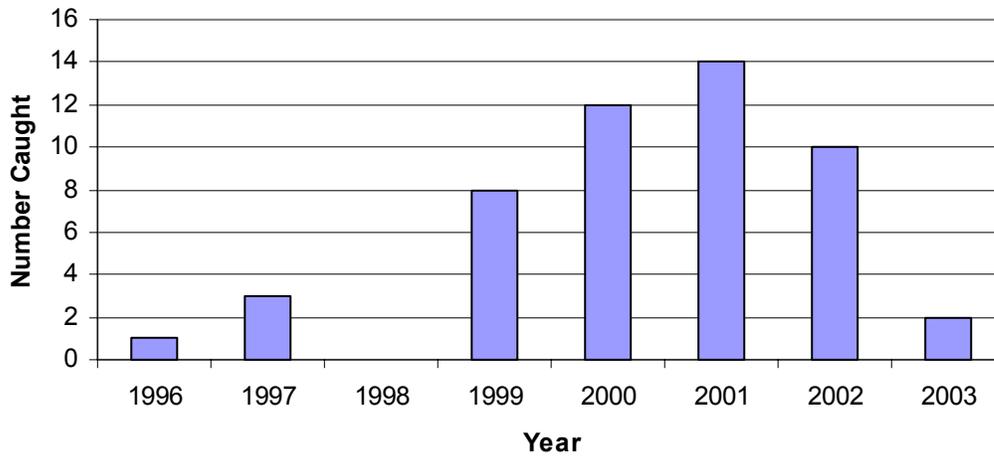


Figure 11. Number of lake sturgeon recaptured by commercial fishers from 1996 through 2002

DISCUSSION

Saginaw Bay seems to be an area occupied by juvenile to sub-adult lake sturgeon. This result may be biased by the gear used to collect the lake sturgeon. Trap nets may not be big enough for a large lake sturgeon (the target species are lake whitefish and yellow perch). Larger lake sturgeon may be occupying different areas of the bay then are being fished with trapnets. Because limited numbers of adult lake sturgeon have been captured in the Bay and restoration of the species is dependent on spawning adults, future studies should focus on determining whether or not adult sturgeon occupy the bay.

One possible future study would be to use trap nets with a larger pot opening or large mesh gill nets to determine if adult lake sturgeon are encountered. This would allow us to assess whether gear bias is the reason for not catching adult sturgeon and whether or not adult sturgeon do occupy the bay.

The 2003 fishing season yielded 19 lake sturgeon, the lowest catch since 1995. The 2001 season was the highest season with 69 lake sturgeon caught. Of the 19 lake sturgeon caught two were recaptures. Prior to the 2003 283 lake sturgeon at large in Saginaw Bay. Two recaptures represent 0.71% of the total tagged fish. This is a much lower percentage compared to last years 4%. A low percentage of recaptures may reflect a high population of lake sturgeon in the bay. Another explanation may be that because lake sturgeon move long distances, the same lake sturgeon are not always present in the bay and available for recapture.

Table 2. Date and growth pattern of each lake sturgeon recaptured by commercial fishers from 1996 through 2003.

Tag Number	Date Tagged	TL tagged	FL Tagged	Girth Tagged	Date Recap	TL Recap	FL Recap	Girth recap
36	10/4/1995	81	71	30	8/17/1996	81	79	30
4033	10/29/1996	77	74	29	5/22/1997	77	72	29
4036	4/26/1997	104	93	38	4/26/2000	112	102	39
4054	4/28/1997	103	92	39	5/28/2001	128	118	49
4125	6/6/1997	88	79	35	9/29/1997	94	86	33
4125	6/6/1997	88	79	35	10/30/2001	117	110	36
4047	10/6/1997	116	107	48	6/3/1999	117	108	46
4056	10/24/1997	98	90	32	4/26/2001	113	103	39
4059	5/4/1998	90	84	33	5/20/1999			
4114	9/20/1998	75	67	24	4/26/1999			
4159	10/12/1998	116	111	38	4/20/1999			
6270	10/19/1998				6/13/2000	121	112	45
4204	10/25/1998	98	91	36	6/13/2000	102	96	39
4204	10/25/1998	98	91	36	5/14/2001	108	99	37
4204	10/25/1998	98	91	36	5/18/2001	108	99	37
4110	11/17/1998	152	140	56	10/11/1999	150	138	55
4110	11/17/1998	152	140	56	11/25/1999	150	137	58
4110	11/17/1998	152	140	56	5/21/2000	155	142	58
4093	4/17/1999	140	127	58	5/14/2001	142	132	58
4064	9/25/1999	89	82	31	5/22/2000	91	83	32
4064	9/25/1999	89	82	31	8/8/2000	91	84	33
4168	10/31/1999	132	126	51	11/1/1999	132	126	51
4258	4/11/2000	145	137	53	4/27/2000	145	137	53
4169	4/28/2000	118	108	45	10/24/2002	122	109	51
4255	5/30/2000	140	132	55	6/6/2001	139	134	56
4066	10/24/2000	107	100	38	12/2/2001	107	101	43
9106	5/7/2001	117	109		10/2/2002	120	114	47
4216	5/14/2001	61	53	25	5/30/2002	71	61	32
4214	9/16/2001	102	94	43	10/24/2001	97	87	42
4214	9/16/2001	102	94	43	4/19/2002	97	90	44
4214	9/16/2001	102	94	43	7/29/2002	97	90	44
4432	10/4/2001	112	76	39	11/16/2001	105	99	36
4434	10/8/2001	97	89	32	6/7/2002	95	89	32
4016	10/11/2001	119	110	41	11/19/2002	122	112	46
4068	10/22/2001	130	117	44	5/1/2002	130	117	46
652	8/9/2002	72	65	27	5/16/2003	74		28
650	9/29/2002	120	111	45	10/8/2002	120	111	45
10067	4/19/2003	99	88	33	6/30/2003	96	92	33
119					5/1/2001	81	77	30
285					6/6/1997	88	81	33
485					11/9/1999	114	106	41
4152					10/19/2000	84	79	29
6723					12/3/2000	91		
6778					5/1/2000	124	114	43
6785					5/30/2000	117	108	38
9106					5/7/2001	117	109	
9158					12/2/2000	109	104	41

9175	5/31/2001	107	98	38
9452	10/19/2001	104	97	38
13264	7/16/2002	114	107	43

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